

SUPPLEMENT.

The Mining Journal, RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

No. 1804.—Vol. XL.

LONDON, SATURDAY, MARCH 19, 1870.

{ STAMPED .. SIXPENCE.
UNSTAMPED, FIVEPENCE.

Original Correspondence.

LITIGATION IN MINING DISPUTES:

A SUBJECT FOR THE MINING ASSOCIATION OF GREAT BRITAIN.

The attention of the mining interest has not been sufficiently given to the important subject of law reform. No class of property-owners are more interested in having efficient tribunals for determining disputes arising in the way of trade than those who are occupied in developing and working mines; and yet no special care has been taken to obtain the tribunals so much required. The shipping interest has secured in the new Admiralty Bill the right of the parties to have an assessor who understands nautical matters sitting with the judge. Patentees have urged upon the Legislature the necessity of having scientific assistance upon the judicial bench when the intricate and difficult questions arising under our Patent Law are brought to trial. At the last meeting of the Associated Chambers of Commerce the question was discussed generally, and a resolution was passed, declaring the necessity of establishing Tribunals of Commerce. We have reason to know that action has already been taken upon this resolution. Indeed, a draft Bill, founded upon it, is now in circulation for the approval of the Chambers.

Of all our national occupations mining presents those peculiarities which more than any other require special knowledge to be brought to bear in all cases in which disputes arise. The very nomenclature of mining is most difficult to be understood by persons who are without personal knowledge of the occupation. It is within our experience that a judge at *Nisi Prius* has enquired at the end of a long sitting, arising out of a case of trespass in a gate-road, "why evidence was not given of the fastening on the gate?" Doubtless his lordship thought that the walking (gate, corrupted into "gate") road was a road closed by a gate, which had been broken open by the trespasser. What but Chinese to men trained in Westminster Hall are such terms as "jackey-pit," "sumph," "side bassot," "gob-road," "kibble-road," "winzes," "tutwork," and a thousand others? And yet it is Westminster Hall that must furnish us with our public judges to try lawsuits arising in mining cases. What is the effect of all this? That the mining interest has not the advantage of the public tribunals of the country. Mining cases are tried by private judges selected by the parties—and, by-the-by, often selected with very great difficulty—called arbitrators. Few mining cases are tried in a public Court, and when they are tried it is necessary to get so much expensive evidence to instruct the Court that they are always tried at a considerably higher expense than any other class of actions. Arbitration, although, perhaps, safer in its result, is even more expensive. The arbitrator has too little authority over the counsel. A barrister in large practice naturally makes the arbitration business subordinate to his Court business. Why? Because the sittings of the Courts are fixed for particular days, which he cannot alter. But he can, by arranging with "the learned gentlemen on the other side," bring the arbitrator and witnesses together at any selected time, when Westminster Hall is not busy. This is one source of expense, of some discomfort, and often great delay in settling mining cases.

If the mining interest will only take advantage of it there is now a clear way out of the difficulty. Reference is made in the First Report by the Judicature Commission (just issued) to the inconvenience of the present arbitration system, to the inability of the barrister to give that continuous attention to the case which is essential to its being speedily and satisfactorily disposed of, and to the difficulty in the way of an expert arising out of his want of knowledge of the law of evidence, and of the rules that govern law proceedings. The report also refers to the Report of the Patent Law Commissioners, issued on July 29, 1864, in which those Commissioners recommend that the judge should sit with scientific assessors and with a jury to try patent cases. The Judicature Commissioners recommend that which it occurs to us would be peculiarly useful in mining cases. They say that there should be attached to the Supreme Court (to be established) Official Referees, that a judge should at any time have the right of summons, and with or without pleadings, and generally upon such terms as he may think fit, to order a cause, or any matter arising therein, to be tried by a referee—such trial to be by one of the Official Referees, unless the judge otherwise orders. That is, that for the future the judges in mining—hitherto private, and paid by parties—should be public officers, paid by the State. And, as though to make the alteration more suited to the class of cases under review, where technical knowledge is so often necessary, and in which all the information is local, the Commissioners recommend that "The judges should have power to direct where the trial should take place, and the referee should be at liberty, subject to any directions which may from time to time be given by the judge, to adjourn the trial to any place which he may deem to be more convenient." To save the ruinous costs of the adjournment, the Commissioners recommend, as here: "The referee should, unless the judge otherwise direct, proceed with the trial in open court, *de die in diem*, with power, however, to adjourn the further hearing for any cause which he may deem sufficient to be certified under his hand to the Court."

This appointment of the Official Referees is quite independent of the general organisation of the new system of judicature. It stands upon its own merits, and such officers would be as useful under the present system as under any new scheme which may be devised. Why, then, should we wait to get that which is so requisite for the mining interest until the lawyers have agreed in all the recondit points relating to the fusion of law and equity, and settled the niceties of one uniform system of special pleading, which shall be "certain to every intent?" The Lord Chancellor has introduced three Bills into the House of Lords—one (which has passed that House) to do that which a modern transatlantic writer would term "utilise" the election judges; the second, to establish a Court of Appeal; and the third, to constitute out of the present Superior Courts of Law and Equity one Supreme or High Court. It is to this last Court that the Official Referees are ultimately to be attached. We ask, Why not attach them now? The need of them can never be more pressing than at the present time. Hence, we urge this matter at this juncture upon those of our readers whose interests would be vastly served by the establishing of a system which would include all the advantages of the domestic tribunal of arbitration with the authority of a public court of law—by a system under which a competent judge, assisted, if necessary, by an "expert" assessor, might hold his sittings day by day until the business should be finished where the cause of litigation arose, where

the *locus in quo* could be viewed, and where the witnesses and the contending parties all alike reside.

Happily there is an organisation whose province it is to take such a matter in hand. Whilst, therefore, we prominently call to the subject the special notice of our readers as a body, we beg to commend it to the prompt and vigorous action of the Mining Association of Great Britain. The Council of that Institute should lose no time in taking up the question with a view to the legislative action that they are well able to inaugurate, and which, if once begun, could not but issue in one of the most conspicuous successes which have yet attended the operations of the executive.

MINERS' PETITIONS.

SIR,—I think it was in the year 1842 that Sir Robert Peel proposed his famous Income Tax measure, which was to tax all incomes above 150*l.* per annum. I recollect petitions were got up against it, and at every street corner you were solicited to sign a petition against the *Odious Income Tax*, and workmen at 10*s.* and 12*s.* a week were busily signing it. Much in the same way is the miners' petition got up. The miners give themselves no concern about it, and would as readily sign a petition to shut up all collieries until the ventilation was better, or any equally absurd thing that they may be harangued into, as the labourers who never hoped to make 150*l.* a year, signed the petition against the income tax.

Can anything possibly be more absurd than this?—"That every child between the age of 12 and that of 16 years shall go to school for not less than 10 hours every week." A collier to whom this was mentioned the other day very properly remarked that at the age of 16 they (the boys) began to pay for their meat—that is to say, when a boy reaches 16 he considers himself no more a boy, but a man, and, instead of allowing his earnings to go into the family purse, he allows his mother so much for boarding him, generally about 8*s.* to 9*s.* a week, and keeps the rest to himself. Sometimes he leaves the family home, and goes to lodgings. He is then, at all events, ready to go to work on his own account, and makes all the wages ever he will make. Honourable members whose sons are a burden on them until 22 or 23 have no idea of this; but the fact is as I have stated.

As a rule, colliers do not work hard, whatever may be said to the contrary. No doubt, it is not so agreeable work as in sunlight, but it is not hard work, and a boy soon makes a man's wage. The wages of collier youths are infinitely better than the wages of the youths of other trades. For example—At 10 years of age, a quarter man; at 12, half a man; at 14, a three-quarter man; and at 17, a full man. That is to say—in a colliery the putter would take in turn four tubs from the man, three from the three-quarter (16), two from the half man (12), and one from the quarter man (10), in regular rotation, until all the day's work was drawn, and in this way, if a man makes 6*s.* a day—

A youth of 17 makes	5 <i>s.</i> 0 <i>d.</i> a day.
" 16 "	4 <i>s.</i> 0 <i>d.</i> a day.
" 12 "	2 <i>s.</i> 6 <i>d.</i> a day.
" 10 "	1 <i>s.</i> 3 <i>d.</i> a day.

But very often they make more than this. The 12 and 14 hours a day grievance is all nonsense. I challenge anyone to say that a boy is ever necessarily down a pit 14 hours a day, and in nine cases out of ten he is not down 12 hours a day; I think 10 hours a day is about the average. I might go through the whole catalogue, and show it up, but what is the use? There are a lot of "humanitarians" who, knowing nothing about it, only that they will not be required to put their hands in their pockets, would go into any nonsensical scheme; there are others with—shall I say at least—other motives. E.

EXTENSION OF THE SOUTH STAFFORDSHIRE COAL FIELD. THE SANDWELL PARK SCHEME.

SIR,—A subject of considerable importance has recently come before the public, under the form of a new company to sink a trial shaft on the Earl of Dartmouth's estate, in expectation of discovering coal. It may not be out of place to summarise the case from the geological point of view, seeing that it is full of interest, whether we regard it in the light of the spirited enterprise of the shareholders, or the novelty in mining annals of attacking the Permian sandstone to pierce to the coal stores beneath, or the immense impetus which will be given to the prosperity of Birmingham, and, indeed, of the whole of the Black Country, in the possible event of finding the Thick coal and good ironstone. The South Staffordshire coal field may be compared to an island of coal measures rising amid the surrounding New Red Sandstone of about 20 miles by 7 in its extreme dimensions. At the north and south the coal dips somewhat abruptly under the sandstone, and at the eastern and western sides it is suddenly cut off by what have been termed "boundary faults." In a few places these east and west boundary faults have been stripped, and have hitherto been supposed to be downthrows of several hundreds of feet, and have not been attempted to be explored. I may here, however, suggest that nearly all our great faults are of the kind called "trough faults"—that is, a downthrow of the strata for a certain distance, and a little further on an upthrow generally equal to the downthrow, or nearly so. And, indeed, from the nature of faults generally, and from a consideration of the forces which have caused them, it is evident that there is greater probability of an extensive fault being a trough fault than of its being a single fissure. The case in point may or may not be an example of this.

A little south of West Bromwich this eastern boundary fault was stripped in the Thick coal at a depth of 280 yards for a considerable distance as a decided downthrow fault, presenting the usual symptoms of slightly rising as it neared the line of fault, and then suddenly collapsing from 30 feet thick to 3 or 4 feet, and finally ceasing altogether, leaving a sort of feather-edge at the bottom of the coal. Half a mile further south, at the Bullock's Farm Pits, a fault very similar to this, and linable with it, was passed, and the coal worked to the east of it, at a depth of 360 yards from the surface, for a distance eastward of 70 yards, when an upthrow fault, parallel with the supposed boundary fault, raised the coal beds some 32 feet, and the coal rib was finally left in its normal condition at the boundary of the property at 350 yards deep. Again, two miles south of Smethwick, where the Permian rocks thin out, the coal measures set in; and still further south, at the Lickey Hills, the coal again appears in connection with Llandoverly limestone; and beyond Birmingham the coal rises to within 150 yards of the surface in the rapidly-developing Warwickshire coal field.

The next question present to the mind of the geologist would be—Do the seams of coal at these various points show marks of identity? They do not, at least to the extent that might be expected. But when we consider how widely the character of beds in the same coal field will be varied by a fault—beds that are really, saving the fault, continuous—it need not be matter of surprise that specific identity should fail to be established between the South Staffordshire and Warwickshire coal fields. As an example of this we may cite the great Bentley fault in the northern part of the coal field, a trough fault, but finally an upthrow of 120 feet, which brings in the previously out-cropped Heather, New Mine, and Fire-clay coals. But we may ask in vain north of this great fault for the New Mine coal, or Fire-clay; instead we hear of Yard coal, of Five-feet, of Old Man's coal, of Deep and Shallow coal. It is to be observed, however, that the aggregate thickness of the coal beds in the north, under different characters and names, is about equal to the aggregate of the rich beds in the south part of the coal field.

The same probability of extension under the Permians applies to the western side of this coal field; and, indeed, an elaborate paper was read a year or two ago by Prof. Beckett, in which he endeavoured to show that the "intermediate measures" thinned out towards the west in such a manner as to render it highly probable that at no great depth beds of coal might be reached through the Permian and New Red Sandstone strata, which, on the surface, separate the Staffordshire Black Country from its *confinere* on the banks of the Severn. What, then, are the reasons which induce the experimentalists to sink for coal through the Permians of Smethwick, rather than at Tetterhall or Stourbridge? Firstly, there is no reason to expect less difficulty in any other place. Secondly, no such large estate is to be had elsewhere so suitable for the trial. And thirdly, the obvious advantages of rail and canal, and the neighbourhood of Birmingham.

The nature of this undertaking is essentially speculative, seeing that the existence of the coal is not proved, and that the depth at which it occurs, if there is matter of conjecture. Mr. H. Johnson, the spirited promoter, considers that 450 yards will, probably, be the depth at which coal will be reached, others think it may be 600 yards, and others again that it may never be found at all. Another serious difficulty is apprehended by others, which may be understood from a consideration of the lie of the coal measures on the Silurian rocks. These strata, on which rests the base of the coal measures, have a gentle rise towards the east; and, moreover, instead of presenting a uniform inclined plane shows an undulatory surface, sinking into hollows, now filled up by coal measures, and rising into banks or swells, cutting out for the extent of the swell or bank the coal measures, and in some places the Silurian beds rise to the surface to the total exclusion of the coal, as at Dudley, Sedgley, Wren's Nest, and Walsall. Now, it is impossible to predict the nature of the Silurian foundation under the Sandwell estate, but at West Bromwich and at Oldbury there seems to exist a bank or swell of the Silurian, which at the supposed boundary fault cuts out the coal, and the Permian rocks are seen resting on the Silurian. The exact nature and extent of this Silurian bank, whether the coal to the eastward may be partly or wholly cut out, whether, if the coal be found, there may prove to be faults and fractures of such a nature as to preclude economic working, whether valuable beds of ironstone may be associated with the coal, and whether the depth will be within the limits of profitable working, are problems which the directors of the Sandwell Park Colliery Company are preparing to solve.

Should this exploration prove a success there is not the slightest doubt that similar enterprises will be commenced along what is now the boundary line of this coal field, doubling the present extent of the Black Country, and energising its towns with fresh vigour. Willenhall, March 16. GEORGE HOLT, F.R.G.S.

WREXHAM COLLIERY, NORTH WALES.

SIR,—The two pits now in course of sinking at Rhosddu, about one mile from Wrexham, were commenced in February, 1864, by Messrs. Macintosh and Company. The extraordinary difficulties which have been encountered from quicksand in the alluvial deposits near the surface, and from the large quantity of water flowing into the pits out of the sandstone rock met with at the depth of 124 yards, have so far delayed the sinking that the first workable seam of coal has only lately been reached at the depth of 200 yards, but as it is of inferior quality, compared with others which are found below, the sinking is being continued for the Main coal, and other seams. The company have shown great perseverance in carrying out this arduous undertaking; however, there is every probability of valuable deposits of coal being found, and as the pits are advantageously situated near the Shrewsbury and Chester Railway, for securing the conveyance of coal to Birkenhead and to inland parts, a good demand for coal may at least be reckoned upon. The pits are sunk in a line, nearly north and south, 40 yards apart. The north pit, 13 ft. in diameter, will be the downcast, and divided for coal drawing and pump shafts. The south pit, 11 ft. in diameter, will be the upcast or return air pit, according as the furnace or the mechanical principle of ventilation is adopted, and used also for drawing coal. The ground passed through in the pits to March 10, is as follows:—

	Yds. ft. in.	Depth from surface.
1.—Gravel, loam, quicksand, and clay	46 2 4	Yds. ft. in.
2.—Coal	0 2 0	47 1 4
3.—Shale, alternating with beds of rock	76 1 8	124 0 0
4.—Sandstone rock, with much water	39 0 0	163 0 0
5.—Coal	0 0 3	
6.—Shale, and two beds of fire-clay	34 1 3	
7.—Coal, the upper stinking coal 7 ft. 6 in. including a shale band of 3 inches in the middle	2 1 6	200 0 0
8.—Fire-clay	1 0 0	
9.—Fakes	1 2 0	
10.—Rock	2 2 0	
11.—Shale	1 2 0	207 0 0

The Drowsal coal is 92 yards below No. 7 coal, at Westminister Colliery, so that 85 yards will have to be sunk to reach it. The Powell coal is next in order, then the Two-yard, Crank, Brassy, and Main coal seams. The Main coal is found 164 yards below No. 7 coal of the section, leaving 157 yards to be sunk to reach this seam, and its depth from the surface would be 364 yards, with similar stratification to that in Westminister pits.

It will be observed that the Rhosddu pits have not passed through the red marl found in the Hafod-y-Bwch pits, which is there about 200 yards in thickness, at Gadden Lodge new pits, 60 yards, and at Kenyon Colliery, about 180 yards in thickness. The same red

marl is said to have been proved by boring near Gresford, and is a member of the newer formation overlying the coal measures. The whole district between the pits named above and North Staffordshire is supposed to have coal under it, which is as yet unexplored, and may be the scene of extensive colliery operations in the future. The dip of the coal measures is about 4 in. per yard eastward. A fault downthrow to east 200 yards, runs between the old pits and the new Hafod-y-Bwch pits of the Ruabon Coal Company, making the latter to be 530 yards deep to the Main coal, but no great influx of water was found in sinking these pits. Similar conditions may prevail east of Rhosddu pits in the Gresford district, giving great depth to the east to reach the coal seams, and a moderate quantity of water from the water-bearing strata.

The first difficulty in the Rhosddu pits was with the running sand, which occupied two years in getting through and securing. This part of the undertaking—and, indeed, the whole of the sinking operations—have been under the management of Mr. W. Wilson since the commencement. After reaching the sand the pits were widened out to a large size from the surface to the top of it, and the quicksand was penetrated by means of cast-iron tubing, built in rings of 2 feet in height; inside flanges, the lowest ring being pointed, and the back of the tubing presenting a smooth surface to facilitate its descent. The joints were made tight with sheeting deal, and bolted together; this length of tub was forced down in six rings, or 12 ft., and could not be made to penetrate further, by screws or any other means. A second length of tub was then commenced, 4 in. within the former, with segments of the proper sweep; this was forced down in six rings, and could not be sunk further. A third length of tub was similarly sunk within the second, also in six rings. A fourth length of tub, sunk similarly within the third, consisted of eight rings, and passed through the quicksand into the clay below. The sinking was continued until a secure foundation was obtained on which to lay wedging-curbs, from which the permanent tubing was built up to within 10 yards of the top of the pits; the space between this and the sand tubing being filled up close with stonework. The quantity of water flowing into the pits during the operation of putting through the sand was not great, but the quantity of fine sand it held in solution had the effect of filling the interior of the tub with it, and forming large cavities behind the tubing, causing a subsidence of the surface. A 22-in. horizontal-engine was employed in pumping, with a 12-in. lift; and a bull-engine, 48-in. cylinder, was erected over the south pit for a 14-in. lift. After securing this part of the pits, the sinking was continued through 76 yards of shale and rock, with some water, but not in large quantities, until the sandstone below was penetrated at 124 yards depth, which gave off large feeders of water throughout, and necessitated the erection of strong engines and special pumping-machinery to overcome it. The 76 yards of shale and rock was successively tubbed up to the first wedging-curbs on entering the sandstone. It will be necessary to enumerate the engines at present erected at these pits to show the power in operation to pump the sandstone-feeders. At the north pit an 80-in. Cornish engine, 10-ft. stroke in cylinder, 9 feet in the pit, raised water originally with an 18-in. bucket-lift from the bottom to a cistern, and delivered with an 18-in. plunger-lift from thence to the surface. This was subsequently increased by adding another 18-in. bucket-lift at bottom, and substituting a 24-in. plunger at the top. Also a winding-engine of two 24-in. horizontal cylinders 5½-ft. stroke, with pinion and spur-wheels proportioned as 1 to 2, connected by horizontal-rod, and two T-bobs, to the pump-rods; there were two bucket-lifts 18 in. diameter, one delivering at the surface. At the south pit the 48-in. bull-engine, 8-ft. stroke, pumped with 14-in. buckets, in two lifts. The winding-engine at this pit raised water with an iron tub—holding 200 gallons—at the rate of 50 tubs per hour. When all these engines were in operation the quantity of water raised is calculated as follows:—

Cylinder.	Stroke in	Diameter	Strokes per	Gallons	Gallons per
Inch.	pit, feet.	inch.	minute.	per stroke.	minute.
80	9	24	9	176	1584
2-24	6	18	12	66	792
48	8	14	10	53	530
2-30	5½	14	10	53	530
Gallons per minute, or 4,623,680 gallons in 24 hours.				166	3072

Allowing for loss and stoppages, the quantity delivered would be about four million gallons in 24 hours. With all this power, the pumping was continued for three months without making any perceptible impression on the flow of water; after this it was gradually overcome, so as the sinking could be resumed, the sandstone sunk through, and the water tubbed back up to the wedging-curbs previously laid. The tubing is 1 in. at the top, increasing downwards to 2 in. in thickness at the bottom, and is inserted in both pits for 155 yards continuously. The most of the segments are 4 ft. by 2 ft. deep, with inside flanges, strengthened by one horizontal and two vertical ribs, forming six divisions. Into four of these divisions blocks of metal are fixed to support the side flanges, which have shown signs of weakness. The lowest rings of tubing are 15 in. deep and 2 in. thick. The pressure of water at the lowest part of this tubing is calculated to be about 200 lbs. per square inch. The pits are now successfully tubbed, the Cornish engine alone pumping at the rate of three strokes per minute, with 18-in. lifts, as before. A remarkable fact relative to this sinking, and the sinking of Mr. Clayton's new pits at Wheat Sheaf, about one mile distant to the north-west, and rise of strata, is the connection of the feeders between them in the sandstone. In sinking through the sandstone at Wheat Sheaf little water was got, as the pumping operations were then in full force at Rhosddu, but since the tubing was inserted there the feeders have come in at Wheat Sheaf, so as to fill the pits, one of which was sunk 220 yards through the Brassy coal, and the other 190 yards. At present pumping operations are going on to lower the water to the depth of 60 yards, where wedging-curbs are laid, to tub back the feeders in the sandstone.

The Rhosddu pits are secured with 10 yards of walling at the top, next 155 yards of continuous metal tubing, and 9-in. walling below that, composed of 4½-in. fire-brick inside, and one ring of 4½-in. common brick outside; the latter are made near the pits. The engines are of a first-class character. The Cornish and winding-engines were made at John Taylor and Sons' foundry, Sandicroft. The winding-engines are fitted with double-seat valves, four eccentrics, and work direct to the drums; these are adapted for flat-wire ropes, one of which is now used in each case for sinking. There are six boilers at the north and four at the south end, all plain cylindrical boilers, 30 ft. by 6 ft. in diameter; steam pressure is 30 lbs. The bull-engine was made at Mr. J. D. Leigh's Patricroft Works.

March 15.

MINING ENGINEER.

IMPROVED PUMPS.

SIR,—It was some time since mentioned in the *Mining Journal* that an improved pump had been invented in which the whole of the cumbersome pump-rods were dispensed with, and a small tube, which runs down beside the ordinary pump-tube, used instead. I do not exactly remember the details of the arrangement, but know that there was a cylinder both above and below ground, and that these were connected with each other by pipes; but how the water was raised I do not know, and should be very glad if some of your correspondents could inform me. It was an atmospheric pump, and, I think, the air was compressed in the upper cylinder, and forced down the tube, in order to elevate the water. I presume, from hearing no more of the invention, that it did not answer in practice, and would, therefore, suggest what may be considered a modification of it.

Steel tubes can now be so readily and cheaply made that their use would be practicable now where a few years since they would have been altogether inadmissible. It would not, I think, be difficult to make them to stand a pressure of even 500 lbs. on the inch; and I merely propose to submit them to a pressure of about one-fourth of this. For the passage of the water from the bottom of the mine to surface I would have about a 6-inch tube, open at the top, and connected with a cylinder at the bottom, and to this pump-cylinder I would attach a second or working cylinder, to give it motion. The latter could be connected with a small tube with an engine at surface, and worked as an ordinary high-pressure engine, but by water instead of by steam. There would be no difficulty of using a pressure of 120 lbs. on the inch; and if the pump-cylinder were made about 12 in. diameter, and the working cylinder about 3 in. diameter, I believe the water would be raised conveniently and economically. The advantage of using water instead of air as the motor must be obvi-

ous; it would be much cheaper to keep the pipes water-tight than air-tight, and there would be considerably less loss of power, owing to the non-compressibility of water.

The advantage of having so much additional room in the shaft would, no doubt, be great, yet this would, in my opinion, be small in comparison with the saving which would be effected in repairs. Two or three ball-valves (I should prefer several of a smaller size to one larger one) at the bottom of the large tube would be all that would be required, and these would not be liable to get out of order. In the case of very deep mines, the pressure upon the lifting-tube might be reduced by breaking the column, and inserting an additional pair of cylinders, letting the exhaust water (if I may use the term) from the working cylinder pass on to work the other working cylinder at the bottom of the mine.

Merthyr, March 16.

SAFETY-LAMPS.

SIR,—The experiments made by the North of England Institute of Mining Engineers indisputably prove that perfect dependence cannot be placed in any of the lamps ordinarily sold for the use of miners; I should, therefore, be glad to learn the highest price which it is customary to pay for lamps by those coalowners who are not restricted for capital, and who regard safety in their mines as tending more to economy than limitation of first outlay. This may appear a curious question to many, no doubt, but its object is to ascertain whether the introduction of the electric miners' lamp is altogether impracticable on account of its cost. The great advantage of the electric miners' lamp appears to me to result from the impossibility of igniting the explosive gas with it, owing to the power of producing light with it ceasing before it would be possible to bring that light into contact with the external atmosphere, whether pure or explosive.

The price at which electric miners' lamps have hitherto been offered has been, I am well aware, far too high for their adoption to be at all probable; but so many improvements have been made within the past few years in connection with the production of electricity cheaply that I am inclined to think that they might now be introduced. The cost of the Giesler tube, which forms the lamp itself, would be a mere trifle, and if the electricity could be supplied—say by a dynamo-magnetic engine—I believe a large colliery could be lighted for a few pounds per week. At present the cost of these machines is somewhat high, but if it were arranged to introduce the electric system of lighting at (say) a dozen collieries, I believe the machines could be supplied at a very reasonable price. As a comparatively small amount of power is required to work them, it is not improbable that an endless rope in the shaft attached to the cages could be made to furnish the necessary motion to the machine.

H. J. F.

EFFECT OF TEMPERATURE ON THE BAROMETER.

SIR,—Would some correspondent kindly inform me how it occurs that the barometer, standing alongside the thermometer in the same room, is not equally affected by the heat or cold? If, by raising the temperature of the room the mercurial column of the thermometer ascends (say) 10° or 12°, I find the mercury of the barometer remains comparatively unmoved; and, even when the mercurial column of the thermometer has descended to (say) freezing-point, the mercurial column of the barometer is often at its highest point. I am aware the barometer is open to, and depends upon, the atmosphere for its action, and the thermometer is closed, and depends upon the heat and cold for its action; but I cannot understand how it is that the mercurial column of the barometer is not affected by the heat, &c. If you can put me right upon this point, and will do so in your next, you will greatly oblige—

A SUBSCRIBER.

N. ENNOR ON THE MINERALISATION OF THE STRATA AND VOLCANIC MOUNTAINS, CONTAINING NO LODES CHARGED WITH METALLIC SUBSTANCES.

SIR,—I often read your valuable remarks, which are certainly very interesting, but when I read your weekly mine reports I am at a loss to know what the reporters mean when they wind up by saying the mine prospects are good—the stratum is highly mineralised. To me this is very vague. Is it not a farce, to draw shareholders on?

I have taken the liberty to ask the writers of these reports to point out a single stratum in the whole earth's formation which is not highly mineralised. Sir H. Davy said that silica was the purest mineral found; if so, these writers of mine reports ought also to be aware that about two-thirds of the earth is silica, and but few layers, or strata, are to be found without it: silica is 98 parts mineral. Then, I say, practical men who report on mines, and couple with them the strata, should come out openly and say what the stratum is mineralised with, and if it indicates to aid the formation of a large deposit of any kind of ore, and what ore it will produce, whether yellow, or grey, or oxides of copper; if not either, say if it indicates lead, zinc, or antimony, tin, manganese, or iron. These young aspirants, or would-be mine reporters, I may expect have had the education of the present day; then I do not blame them for attempting to run, but I caution them not to be too fast. Let them carefully study the great universal law of Nature, and abandon all old, by-gone tales. I remember, when a boy, I was passing with father near old Caple Tor Mine, close by which we met Hitchens and Brenton. They were then the great guns of the day. Young mine reporters then knew well that if a shot were fired from either of them it was sufficient to clear a host of young reporters off the field. In their conversation with my father he remarked that the stuff drawn from Caple Tor Mine indicated but little promise for the future. He then pointed out the old gossan burrow, a little distance off, as a far more promising spot, when old Mr. Hitchens asked if he did not know the old adage, that "Where it is, there it is."

I was met many years since in print by the Callington man, who argued on the same ground. The old gossan burrow named is now known as the Devon Great Consols. When I look at these men's reports I am not inclined to think they are one step in advance of that age; still, their own reports show they believe these mineralised strata aid in the precipitation of large deposits of ore, yet their theory is a very vague one. I cannot refrain from asking them to come out with something more definite. Let their report be a something that can be analysed, and passed for what it is worth; as it is, it is only a loop hole to pass them through. I openly tell them that all strata are mineralised, and ask them to define what strata should be mineralised with to cause the precipitation of a large deposit of (say) copper, or any other ore. If they have not sufficient knowledge and confidence in themselves to do this, they should refrain from remarking on the mineralisation of strata. They prove no point gained by the mineralisation they mention; it may be acting *vice versa*. It almost causes me to conclude that it is through their deficiency in mining knowledge that the mine shareholder finds himself so often pitched, minus his money, into Slothead's pond. I may venture to tell these mine reporters again that every stratum is mineralised, and is either growing or decaying—that is, changing in its component parts; and that there are at least three mineral substances present at the time of every mineral formation. When the stratum or rock was charged to excess with one or two of them, should either be absent, the next akin to them steps in to aid in forming the same ore, but it is there in a different character. This often happens. These three substances are nearly always present, but at times not in sufficient quantities; in such cases other substances (say, 4, 5, 6) are to hand, ready to join.

Under these circumstances, I think the young men who are now coming into the field must admit that it is essential they should know what substances the strata are charged with, and whether they are or are not congenial to the formation of the ore they are reporting the mine will produce. Without this knowledge they must admit that mining can never be reduced to a science. I know what these men mean by the strata being mineralised, they see the red oxide of iron oozing out of the rock; but I fearlessly tell them that it is no guide. Nearly every stratum of rock but chalk is mineralised by iron—it is the very cement for combining large portions of the earth's layers together. I venture to go further, and say that a practical man should, if he fell from the clouds in any unknown part of the world, and he watched the rocks by the way side, be able to tell when he came into a promising mineral district. I am inclined to think three-fourths of the men who go abroad to survey for mines do not know when they are on mineral strata, or even what stratum

it is, if not granite or clay-slate. They must not be guided by iron oxides, they are so general or common occurrences, they are no true guides. I think I have said sufficient on these mineralised strata reporters to stimulate them to move on a stage further. I next make a few remarks on what I believe to be the origin of strata. I have long come to the conclusion that they are all formed from the three original gases; they have worked under a great divine law, that unites them in different proportions, and forms every different substance; they all live and die and return to their originals, and are re-converted over and over again through time to eternity. Man can trace no beginning nor ending. We may assume that the three gases formed what professional men term the primitive rocks. These professional men have spent tens of thousands of pounds endeavouring to trace in them animated life, to no purpose. It might be said my argument shows a faint trace of a beginning. I will not now argue that point, but pass on to carbon. What is it, where did it come from? I have put this publicly before all the professional men, and they decline to give the answer. Then am I left to meditate, and pause for my own answer. I will here give it; if wrong you must be content, I have done the best I am able to.

On carbon I come to the conclusion that it was not an original substance, but it was formed from three gases uniting in some hitherto unknown portions. Was it original, it would be only reasonable to imagine it would have joined the three gases in the first forming of primitive rocks, but it is not found in them but to a limited extent. Under these circumstances I come to the conclusion that under the law I before noticed the three gases, say A, B, C, united, and formed primitive rock or rocks; then the gas produced from them uniting with portions of air and water, formed carbon—say, D; then portions of gas from A, B, C, D, again aided with portions of air and water formed E, then the gas portions coming from A, B, C, D, E, again united, aided by portions of air and water formed F, then it is clear that every new layer would be of different appearance, and no two composed of the same parts. I ask every sane practical man whether every layer in the earth does not bear out this theory as their law of formation from the so-called primitive up to the highest layer known? After carbon formed, the carboniferous layers began to form, and after this life's creation appears to have commenced, and the world seems to have become full of animated life. We have ample proof of this from what is now found in the carboniferous rocks. Should carbon now be taken from the rocks, how long would life exist?

I have not space to carry out this subject in a letter, but I am mistaken and at a loss to discover how our professors, all well-educated men, could have come to the conclusion that the layers, not excepting granite, were once melting matter, and the earth's layers were formed from their eruption; if so, they have to prove they worked under beautiful and well-defined laws, to place every layer throughout the world in its right place, and I will only ask them one simple question. Can they show me that in the outpouring of a real volcanic mountain a lode formed and charged with a large deposit of copper or lead? Volcanic mountains are only slag scoria, such as come from the copper and iron furnaces. Professionals talk of granite and nearly all the high hills being volcanic productions; this to me is absurd, I contend there is not a rock in the world which contains lodes or veins with large deposits of metallic substances in them that was ever volcanic. I am open and ready to discuss with any professional man in the world on this subject. To make these things a shade clearer I will make a few remarks on the granite formation. Practical men do not believe in granite ever having been a melted mass; they know it is a crystalline rock, with three sets of crystals—first, silica; second, felspar; third, mica. What is silica? It is a single substance, over 98 per cent. mineral; felspar is 70 per cent. silica, 15 of alumina, 14 of potash, with other traces; mica is 47 silica, 22 alumina, and 15 potash. This analysis was taken from a metallic district; it had 15 parts iron, with traces of schorl, manganese, &c. I may notice that every hill varies in its portion of formation, schorl is only found mixed with it extensively in tin districts. Practical men know metallic substances are only skin deep, and at the surface, and mixed up with nearly every rock. I discard nearly every metallic substance from granite at (say) half a mile deep; in that case it would then contain only silica, alumina, and potash. This granite to the first appearance is shown to contain three distinct substances, and each of them has its own crystal; then two of these are found to contain three substances each; in that case it will then appear to be composed of nine substances, when in reality the whole bulk of granite is only three substances—silica, alumina, and mica; which brings it back to three—the gases. Then, I ask, where is the chemist that has yet proved granite is not formed from the three gases?

I believe every layer of rock, and every substance seen or known, is made up in the same way. I am not inclined to believe that granite at ½ mile deep contains any metallic substance. Alumina clay at surface contains a metal, but it has not been extracted from granite taken 300 fms. deep; then, mica at surface is dark, and contains iron. Query, is it dark, and contains iron ½ mile deep? I have seen mica as yellow as gold, and others white, which contain no iron. I am not a chemist, but in my humble way I can show a thousand things that, like the granite, can be brought back to three. I have endeavoured to show the contents of granite, but this is the work of professors or professional chemists and school teachers; it should not have been left for me. I was hard at work when eight years old, and the little I have learned has been chiefly in my work, or when most other people have been in bed. I was never a unionist, for I believe the law laid down by the all-wise Creator was that every man should earn his daily bread before he ate it. In conclusion I would remark to my brother practicals that I before threw out a hint as to the danger of Slothead's pond, and now earnestly ask them to move ahead in the right direction, and tell professional men and the public what rock about lodes are mineralised with, showing what is congenial to the growth of each ore, otherwise they are at sea, and likely to be in the same boat with the Cornish engineers, and may ultimately be swamped altogether in that detestable pond.

N. ENNOR.

THE COPPER TRADE.

SIR,—It happens that I did not see till two days ago the letter of "Investigator," published in the Supplement to the Journal of March 5. With your permission, I will now make a few remarks on that letter, and on the one which appeared in last week's Supplement. The question between "Investigator" and myself, stated broadly, is whether the present market price of copper is or is not below its natural value.

"Investigator" wishes the discussion to be based on well-authenticated facts, and twice challenges me to attack the "key of his position," which is that because stocks in 1862 were larger than at present, while the price was 30 per cent. higher, copper is now unduly depreciated. Experience has shown that well-authenticated facts relating to one period do not always prove a safe guide in calculating what will happen at another, and it seemed to me a sufficient answer to this part of his argument to point to the other fact, of production having constantly increased during the last twelve years, in spite of a continuous fall in prices. But let us to look at the history of the stocks of 1862, and see what came of them, premising that I speak from recollection, and subject to correction by your better informed readers. In 1858 the price of copper had fallen very much below the average of the previous four years, and from that time till 1862 it continued to drop. But the eminent authorities of the period had settled that the proper price of copper produce was something like 20s. per unit, and the holders would not meet the market, but went on accumulating stocks until the quantity became in 1862 exceedingly large. Convinced that something must be done, they at the end of 1862 endeavoured by an arrangement with the smelters to work off the stocks, and at the same time support prices. It was soon found, however, that this was impracticable, and early in 1863 a reduction of 9½ per cent. was declared. The largest business in copper ever done in any one year, up to that time, was the result. "Investigator" insists that to prove my case it is necessary to show that sufficient copper can be produced at a fair profit on present prices here to meet the increasing consumption, but the burden of proof, I submit, is on the supporter of the theory that consumption will take off the stocks, and keep pace with production at advancing prices. The question of profit on production *solvitur ambulando*. Mining

adventurers may be the most hopeful of men, but they do not go on sending us increasing supplies of copper stuff from year to year at a loss. Consumption, on the other hand, I repeat, can only be stimulated in the ordinary channels by a reduction of price. Where copper must be used, the price may be a secondary consideration, but it is not so in what may be called the voluntary consumption of the metal. Everyone must have food, and most people must have shirts, metal. Everyone must have food, and most people must have shirts, metal. Everyone must have food, and most people must have shirts, metal.

But to return to ascertained facts. During the last 12 years the price of copper has been steadily falling. During the last three years the average has been, comparatively speaking, extremely low. The average price of tough in 1866 is stated by the brokers to have been 88¢ per ton, and the following are the figures given for the three following years:—1867, 78¢; 1868, 76¢; 1869, 75¢. The imports for the same time are given as follows, in fine copper:—1866, 57,532 tons; 1867, 61,223 tons; 1868, 70,282 tons; 1869, 71,000 tons.

We see from these figures that a fall of 10¢ per ton in 1867, as compared with 1866, has not prevented a very large increase of importations in 1868 and 1869, and the subsequent decline in price to the extent of 7¢ or 8¢ per ton has left us now full, if not excessive, stocks. If these statistics are good for anything they prove that the low prices of the last three years have not been low enough either to check production or to increase consumption sufficiently to restore the balance and to justify the present still lower rates, which are, as I contend, the natural result of the large importations of the two past years.

These facts, however, I admit, do not prove that the present market price is not below the natural value, but they raise a strong presumption in favour of the view that it is not much, if at all, below it. It is impossible to demonstrate that at any given time the natural value of copper is so and so. Cheap carriage and improvements of all kinds appear to have been steadily reducing the cost of production, and a permanent reduction of this cost implies a reduction of the natural value, but the extent of that reduction can only be shown by the average of a series of years before and after the lowest market prices has been reached.

This letter has already run to too great a length to justify me in referring to the other collateral points respecting which I differ from "Investigator."—March 14. NOSIRIS.

THE COPPER TRADE.

SIR,—The discussion which has now been going on for some weeks in the Journal between "Nosiris" and "Investigator" seems to have established at least two points.—1. That prices have never been lower than they are now.—2. That export stocks were larger in 1862 than they are to-day. Beyond this, however, there appears to be great diversity of opinion. As to the results of producing copper at present prices we have very little to guide us. We know that the yield is declining in England, that it has been extinguished in Cuba and California, and almost entirely suppressed in Italy and Russia. Australia and Chili have, however, recently sent us larger supplies, and the yield of copper from pyrites has also of late been very materially increased. But it is apparently maintained by "Investigator" that the production of pyrites copper is now at its maximum, that the very heavy Chilean exports at the beginning of last year were quite exceptional, and that both in Chili and Australia the effects of our present low prices have still to be felt. As to pyrites, the agents of the two great Iberian companies should be able to give us very precise information, and, as it would be for their interest in selling their copper to let it be known that Iberian production was not increasing, we are I think bound to conclude from their silence that they are unable to give us any such assurance. On this point, therefore, I consider that judgment should go against "Investigator."

As to the results of Chilean mining we are singularly in the dark, the mines there, with one exception, being worked as private undertakings. The exception referred to certainly does not place the position of Chilean mining just now in a very favourable light, and yet when the company referred to was started it was supposed to be peculiarly favoured as compared with most other Chilean properties. I believe, too, it is known to several in the trade that embarrassments have lately occurred with more than one private miner in Chili. The exports from Chili in 1869 reached the unparalleled quantity of 55,000 tons fine; but, if "Investigator's" figures are correct, it would appear that from July 1, 1869, to Jan. 17, 1870 (a period of seven months), the exports in Chili have been at the rate of only 44,000 tons fine per annum. The general tenor, too, of recent letters from Chili is, I understand, to the effect that the export in 1870 will be considerably under that of 1869, and that this deficiency would be very materially increased by any large advance in the cost of coals and freight. It is important, too, to observe that for the first time for several years we see a general disinclination on the part of Chilean merchants to sell copper "to arrive." On the question, then, of Chilean supplies, I am disposed to think that "Nosiris" should be non-suited. As to Australia, there has been nothing in the discussion to show that any increase is now going on there, whilst it seems to be admitted that time has not yet been allowed for the effect of our present low prices to be felt there. The greater part of the present Australian production being, however, represented by one mine, we shall soon see by the dividend or non-dividend state of that mine whether our present prices are profitable or not. On this issue I, consequently, recommend that judgment be deferred.

Respecting Colorado, I think it is unnecessary to say anything, as even those who point to a probable large future production there admit that there is nothing to be feared at present. Moreover, it is contrary to all experience to see any country extemporise a large copper production in a moment. Lake Superior mining has been only incidentally referred to in the discussion, and yet I think there are some facts connected with it which may serve as an index as to the general profitability of copper mining at present prices. From many interesting letters which have from time to time appeared in the Journal we have better means of judging of mining at Lake Superior than in most other districts. The urgency with which an increase in the duty on foreign copper was lately pressed by the Lake Superior community on Congress showed the existence of great distress in that quarter. Ingot copper was then selling in New York at about 22 c. per lb. On the passing of the new law the price rose for a moment to 27 c., and from that point there has since been a continuous fall, till by last accounts, 21 c. was the maximum quotation in New York. At this figure (equal to about 85¢ per ton) only two of the Lake Superior Mines (Hecla and Calumet) seem able to yield any profit, and, as a consequence, the last letter which appeared in the Journal announced the closing of another mine at Lake Superior. By the yearly review of the *Montreal Herald* I see that copper mining in Canada is also in a very depressed condition.

The only really cheering point in production just now seems to be the Cape; but the yield from that quarter, however brilliant in results to those interested, is too small by itself to exercise any decided influence on the copper trade. I understand, too, that the great success of the leading mine there has caused all the surrounding country to be tried, and so far to no purpose. Moreover, it remains to be seen whether the Cape is to form an exception to the general experience in mining that mines of rich produce do not last.

Another point which I think has not been sufficiently dwelt upon in the discussion is the very large quantity of old copper which has been thrown on the market by our dockyards. I believe few in the trade are really aware how large the supply from this source has been—both directly from actual copper sales made by the Government, and indirectly by copper taken from vessels sold by the Admiralty. It is generally supposed that henceforth the Government sales of copper will be much reduced, and no doubt the supplies obtained from the closing of Deptford and Woolwich Dockyards, and the clearing of superfluous stocks at Chatham, &c., cannot be repeated; but it would be more satisfactory to have some authoritative declaration from the Government itself on this subject.

And now, after weighing all the facts and evidence referred to in this letter, I am disposed to think there are fair grounds for concluding that the supply of copper in 1870 will be less than in 1869 by at least 8000 tons fine, and that this deficiency may be increased

by any important advance in freights, &c., in Chili, and by any large curtailment this year in the Government supplies of old metal. I am further inclined to think that from the improving state of trade, of which we have evidence both in Europe and America, from the great railway extensions in the same quarters, the activity in marine telegraphy, &c., we are likely to see a larger consumption of copper this year than last. Looking, then, for a reduced supply and an increased use of copper, and bearing in mind that, though our present supply may seem large, no stocks of copper (like of sugar, coffee, &c.) are held at the shipping ports in producing countries, I think there are good reasons for supposing that as the year advances we shall see improved prices for copper, though I cannot as yet perceive any probability of such an extreme rise as "Investigator" appears both to anticipate and to fear.

COPPER MINING ON LAKE SUPERIOR.

SIR,—The prostration of the copper interest of Lake Superior has been so great during the past few years that, with but few exceptions, there has been nothing in the way of news worth communicating, except it were to record the cases of suspensions, and comment upon the concerns declining—neither of which to a correspondent, you are aware, is a pleasant task. Among the older mines, the Quincy and Central are the only ones giving dividends, while the Calumet and Hecla, two new mines, brought out within the past four years, are doing an immense business. Outside, however, of these four mines the entire copper districts have sunk to such a state of stagnation as to afford, with the present price of metal, little hope of resuscitation. Reverting to the Calumet and Hecla Mines, the former produced for the year ending Dec. 31, 1869, 1900 tons ingot copper, and the latter 2900 tons. Their profits now rate as follows:—the Calumet \$30,000 net per month, and the Hecla \$50,000. Were it not for the effect these concerns have in buoying up holders of other property with the hope that the present depression may be bridged over to better times, it is hard to say what would become of property or holders.—Michigan, Feb. 15. Y.

ON THE ASSAYS OF SILVER ORES—No. VII.

SIR,—Want of leisure has compelled me to interrupt my communications on this subject, the last of which, I see, appeared in the Journal of Jan. 8. There are several methods of assaying silver ores besides those alluded to in my previous letters, but they do not present sufficient advantages to demand attention here. The volumetric method of my friend, Prof. Pisani, deserves a passing notice. I believe that Mr. Field was the first chemist to point out the possibility of the process. It is based upon the fact that the blue colour of iodide of starch is destroyed by contact with a solution of silver, iodide of silver being precipitated, and the starch discoloured. The amount of iodine contained in a given volume of a dilute solution of iodide of starch being known, it is merely necessary to deliver this from a burette into the silver solution until the blue colour persists. Unfortunately, nitrous acid, oxide of antimony, and especially arsenious acid, some of which substances are, more or less, constantly present in solution of silver ores, act similarly upon the iodide of starch, and prevent the blue colour persisting after all the silver has gone. This, of course, might lead to considerable errors. Some years ago I modified this method by adding the starch to the silver solution, and using a standard solution of iodine. But the same difficulties arise when nitrous or arsenious acids are present. Nevertheless, when the ores are tolerably rich—when they contain from 100 to 500 ozs., and especially when they have been previously roasted, and the test performed in dilute and cold solutions, this method will be found of very great service, and I have frequently used it as a rapid means of checking the results of dry assays.

A rough method of extracting silver contained in lead ore was made known a few years ago by a French chemist. I have not tried it; neither does it appear to possess the delicacy and accuracy of a chemical analysis. But it seems well calculated to prove advantageous in the metallurgical treatment of lead ores containing silver, and in this respect may, perhaps, rival the Pattinson process. It certainly appears to be more rapid, and is scarcely less ingenious. It consists in mixing the galena ore with 1 per cent. of chloride of lead, and 10 per cent. of common salt. If the galena be very rich in silver, these proportions may be somewhat increased. The mixture is well melted, and then allowed to cool. After cooling, the mass is found divided into two portions, or two distinct layers. One of these consists of sulphide of lead, quite devoid of silver, and the other of chloride of sodium, containing chloride of lead and chloride of silver. The latter is smelted in the ordinary way, and the lead obtained is cupelled for the silver. The precious metal is thus concentrated into a very small bulk of lead.

In former letters I have alluded, at some length, to fahlerz (tetrahedrite) and galena as sources of silver in England; it remains now only to mention the native silver sometimes met with in the gossan of Cornwall, and the ruby and brittle silver ores which are found in that particularly favoured district, extending almost in a straight line from Callington to Tavistock. The latter kind constitute the true silver ore of Cornwall, and no other minerals in these islands yield such high results to analysis. I have examined a considerable number of samples of these ores, some from the parish of Calstock, others from the Lady Ashburton shafts, the Wheal Brothers, Silver Valley, &c. The results of a series of assays might be stated as having yielded fine silver from 80 ozs. to upwards of 8000 ozs., provided the latter results had been obtained on samples from several tons of ore. But specimens fairly chosen from considerable piles of ore, varying from 2 cwt. to 30 tons, have yielded me from 28 ozs. to 160 ozs. per ton; and a result equivalent to 640 ozs. per ton has been occasionally got from samples taken out of bulks of 2 cwt. of dressed ore.

In order to give a still better idea of the rich quality of this pyrrhite and stephanite ore (for both species appear to occur together) in Cornwall, I may add that a gentleman of much experience in mining matters, Mr. Barnard, of Tavistock, has kindly allowed me to publish the results yielded by two specimens of ore from this district, which were analysed for him in my laboratory; one of them yielded 18.50 per cent. of pure silver, the other 25.33 per cent., or more than a quarter of its weight. These samples were enveloped in a gangue of carbonate of iron and quartz, and are some of the richest specimens I have ever met with, either at home or abroad.

T. L. PHIPSON, Ph.D., F.C.S.,
Member of the Chemical Society of Paris.
Analytical Laboratory, Putney, S.W., March 16.

DUTY OF CORNISH MINE ENGINES.

SIR,—As the statement which has been made that at present one-quarter part more coal is consumed by the Cornish engines on the average than was necessary in 1843 to do the same work is very reflective upon Cornish mine agents, I should like to make a few remarks upon it. It is shown by the Engine Reporter that there was a gradual increase in the work performed with a given weight of coal from 1811 to 1843, when the maximum was reached, and that from 1843 to the present time there has been a continual decline. Starting in 1811 with a duty of 20.4 millions of pounds, lifted 1 ft. high by the consumption of 112 lbs. of coal, we find that by 1815 it had increased to 24.4 millions, and from 1815 to 1820 the improvement was no less than 40 per cent., for in the latter year the figures were 34.1 millions. In 1825 it had further risen to 38.1 millions. In the following five years there was another great jump to 51.5 millions, the increase between 1825 and 1830 being thus equal to 35 per cent. In 1835 it had again improved to 56.9 millions, another 8 millions having been added by 1840, when the figures were 64.8, and in 1843 the maximum of 67 millions of pounds, lifted 1 ft. high by the consumption of 112 lbs. of coal, was reached.

Now, if we look back to 1843 we shall find that there were one or two exceptionally fine engines at work, which would be calculated to send up the average, although most of the engines at work were not above the medium quality. There was Taylor's 85-in. at the United Mines, which in February, 1843, was giving a duty 108.5 millions per 112 lbs.; Eldon's 30-in., at the same mines, giving 86.8 millions, and Michell's 70-in., at East Wheal Rose, giving 84.6 millions, and when it is considered that only about two dozen engines were reported on it is not difficult to understand that a high average could be shown. The average of these three engines alone is 93.3 millions, so that if

the average of all the other engines in the county had been but 40.7 millions we should still have had the 67.0 millions for the general average, as stated. But in addition to Taylor's, Eldon's, and Michell's engines, already referred to, we had Penrose's 70-in., at East Wheal Rose, giving 72.4 millions, and Sims's combined 60-in. and 100-in., at Ting Tang, giving 71.8 millions, so that most of the engines in the county must have been, in truth, giving considerably less than 40 millions.

It may be said that exceptionally good engines are quite as likely to be found amongst the engines at present in use, and this is to some extent true; but it is seldom that three engines, averaging 93.3 millions, are at work at the same time. As to the duty of engines, it is well known that their working is very erratic, and all who have anything to do with the construction of engines also well know that two engines made from the same patterns, finished by the same workmen, and worked by the same engineers, will not give corresponding results. How this happens I cannot explain, but it is nevertheless true. Nor is this all. Even the same engine, with apparently the same fuel under the boilers, and receiving equal attention, will not always give equal results. The working of Taylor's 85 in., at the United Mines, in 1843, afforded a striking example of this, for whilst in the February working, at 6.6 strokes per minute, it gave 108.5 millions, as stated; in May, working at about the same rate (6.4 strokes per minute), the duty was only 105.6 millions. I can scarcely think that altering the speed two-tenths of a stroke per minute could, without some other cause, result in a diminished duty of 3 millions; but I do believe that every engine works better at one particular speed than at any other, and this can only be determined by actual trial. Thus, no rule can be given that engines of certain construction, and of certain diameter of cylinder, should be worked at a given speed, for taking two 85-in. cylinders—Taylor's at United Mines, and Sims's at Poldice—we find that the variation of duty for variation of feed of stroke is out of all proportion. The diminution of two-tenths of a stroke per minute with Taylor's gave a diminished duty of 3 millions, whilst the increase of 1.2 strokes per minute with Sims's gave only 1.2 million more duty. At Wheal Prosper, again, with Roberts's 70-in. the increase of nearly a stroke a minute caused a positive decrease. This to my mind proves that every engine has its favourite speed.

But apart from any differences in the engines themselves, I believe that, according to the mode of calculating the duty, any given engine would give different apparent duty according to many circumstances. In other words, I believe that the lifting of 100 tons 1 fathom and the lifting of 1 ton 100 fathoms requires a different amount of power, so that in taking an average every result should be "compensated" before it is tabulated. The means of effecting this compensation I have yet to learn, and shall be glad if any of your correspondents could enlighten me, but in the meantime I ask adventurers, and especially out-adventurers, not to believe without further investigation that one-fourth of their coal is being wasted by the—

CORNISH MINE AGENT.

THE LEAD MINES IN WALES.

SIR,—The *Mining Journal* is the only source through which the truth or falsehood of the prospects in such mines as Van, Van Consols, Assheton, and Tan-yr-Alit can be fully stated or discussed, and I, therefore, write to the Journal upon the great question as to the truth of the reports of the mines I have mentioned. Having heard so much of these mines, I was induced to visit the neighbourhood not long since, and, without having any interest at present in the mines, I thought it well to get what information I could before investing in a limited mining company. It is not often that one finds the glowing reports of agents to be correct, but I will give them their due on this occasion, and say that from what I learnt from parties in the neighbourhood of the mines there can be no doubt as to the truth of the reports. With regard to Van Mines the reports are, if possible, below the mark. It is a wonderful mine, but ere three months are past those who hold shares now will be still more surprised at the success of their adventure. No doubt the shares will see 200% before the end of the year. I also would give one word of advice to those who hold shares, and that is do not part with them, at all events for the next two months. So much for Van.

As to Van Consols, if it be true that some silver has been seen, but not yet made known to the public, there is every prospect of this adventure paying good dividends. That the lode will cut rich there is every indication, and people who know the mine well are anxious to "get in" at present low prices. They will do well if they can buy shares at 4s. each now, for in another fortnight a rise will take place, if not before.

Assheton and Tan-yr-Alit are worth buying at present low prices; the former have seen 17% or 18%, and will soon see that price again—before the end of April. Tan-yr-Alit, according to appearances, ought to be 50% share better before the end of March. I intend visiting both these mines again, for the purpose of inspecting them for myself and a friend, and will write what I have seen and heard.

March 12. A GEOLOGIST.

[For remainder of Original Correspondence, see this day's Journal.]

EXCELSIOR TIN AND COPPER MINE.

March 16.—This mine is in the parish of Stoke Climsand, in the county of Cornwall. It may fairly claim a good geological position, being in the killas (transition slate), overlying the northern slope of the well-known Kilt Hill granite, representing rock formations of a crystalline character, which have not only proved highly metalliferous in Cornwall, but also in all mining districts throughout the world, being, indeed, amongst Nature's principal repositories of metallic ores. Its position in relation to the mines of the district is favourable, several of them (those effectually worked) having been successful, and others, that is to say, some of them—with the chances in favour of their turning out prizes. On the north, east, and south are the West Maria and Fortescue (the agents promising that they will soon be in the Dividend List), Devon Great Consols, Old Gunnislake, Bedford United, and Drake Walls, the four last-mentioned having, as is well known, been profitable productive mines; pre-eminently so the Devon Great Consols, which has paid dividends amounting to 1,168,384% at the close of the last year. To be added to the Clitters, Hingston Down, Wheal Arthur, Prince of Wales, and Princess of Wales, the two before the last mentioned paying dividends, and the other three expected to take a better position before long; the returns of ore that Clitters and Hingston Down are making being considerable, only wanting a better price for copper to render them profitable mines. On the west, and adjoining, are Holmshush and Kelly Bray, both of which have produced a great deal of ore, more particularly the former (2000% worth some months), which gave good dividends for several years—that is to say, the work-mine on the west, including the Flapjack lode, being most likely those of Bedford United Mine eastward, and they run through the entire length of the grant, which is nothing short of 500 fms. The direction in which these mines are to be found, their relative positions to and distance from each other respectively, will be better understood by a glance at the map of the important district in which they are situated than could possibly be understood by any explanation in words, however amplified and minutely accurate. Although there are others in this extensive and undoubtedly very valuable mining property, I am decidedly of the opinion that the Holmshush lodes offer the greatest inducement for prospecting, the chances preponderating greatly in favour of their proving abundantly productive for tin under the old miners' workings on the backs of them, which are of considerable extent, although of comparatively little depth only; perhaps not exceeding 15 or (say) 20 fms., no water-wheels or steam-engines for pumping ever having been brought to bear on them, dating, as they evidently do, from a remote period, when such valuable auxiliaries were wanting; nor is there any evidence of these old workings being in connection with a drainage level, so that under such circumstances—in other words, such great disadvantages—no greater depth could be attained, the old miners being entitled to much credit for what they did, doubtless doing their very utmost to get deeper; and perhaps at the time when it was found impossible their deepening was increased by seeing the richest ore in the bottom and out of their reach. Notwithstanding that the old workings in question are more than likely of comparatively little depth only (for the reasons just intimated), looking at their extent, they must have produced very considerable quantities of tin, which is most decidedly well rewarded for their labours. There is besides the fact, which is too important not to be mentioned, that stones of very rich tin have been found at a little distance to the north, one being fairly entitled to be called a rock, weighing as much as 2 cwt., and of 75 per cent. produce, which with other lode stuff lying about one place and the other must have come from these old workings, having been found in lower ground. Such a grand rock of tin as the one in question I have not many times seen, it being no other than a fair confirmation that it is a portion of a rich lode. This is most decidedly my opinion, which I feel great confidence will be realised by the adit level now opening out a considerable extent of backs (high and dry ground), to be wrought independently of any pumping or hauling machinery, as the least possible cost. At the eastern end of the old workings, the lode referred to has been worked a little by miners of the present day, presenting a good general character, and producing a little tin. It is, however, clearly further west, in the higher ground under the great range of the old workings, where other parallel lode, 6 feet in width, with a burnt-up gossan, showing altogether great mineral strength, a level on which has been driven for a good many fathoms, but at no greater depth than 8 fathoms. The deep adit can be extended to this lode from the before-mentioned one when into it, which will be most advisable, and very likely to be attended with such success as will very greatly enhance the value of this mine. There are other promising lodes in this extensive grant which are known where to be found whenever it may be decided on to make trials of them, but which it may be best to defer (avoiding "too many irons in the fire") and too large an outlay until the profits from the two before-mentioned lodes will well afford to so much money being parted with as will defray the expenses that they will necessarily involve. It is but seldom I feel so fully justified in speaking with such confidence in looking forward to the issue of a mine adventure as I do in the present instance. It is my firm opinion that the deep adit now in such active operation, to come in

under the old workings, will open out such a length of valuable ore ground as to ensure the mine a permanent and prosperous career. I am in justice bound, however, to say that it is my opinion the deep adit will take a little longer coming in under the old workings than is calculated on, although it is more than probable that it will be done before the expiration of the present year, which is not a long time to wait for the realisation of a prize, which I feel sure this mine will prove.—J. H. HITCHINS, Consulting Engineer of Devon Great Consols.

EMIGRATION.

It is singular with what dispassionate calmness and equanimity mankind can look and argue upon the sufferings of their fellow-men, so long as they themselves are exempt from like sufferings. It was once well observed, with more truth and candour than is often met with, "It would cost me much more to know that my little finger was to be amputated to-morrow morning than I told that the whole of China had been submerged, and all the inhabitants of the Celestial Empire destroyed." Dispassionate calmness is a most admirable quality, and it would be well for the country did our senators always bring it into exercise in their administrative assemblies. But may it not sometimes be carried a little too far? While we are sitting still deliberating, weighing the pros and cons of various schemes which have been suggested for the amelioration of the sufferings of the struggling poor, their sufferings are becoming daily more severe. There is but a narrow strip dividing the struggling poor from the pauperised poor, and a step narrower still consigns the pauper to starvation and a corner's inquest. This is no highly coloured picture. These are not the flights of an erratic imagination. These are facts—facts which have been—facts, alas! which still are—and sadder still to contemplate, there seems but little hope of any change for the better until the country is roused to immediate action. Better than any one, or all, of the proposed schemes should be adopted than that nothing should be done. We have more than once thrown out the suggestion that the Government should, without delay, organise an emigration scheme, or subsidise largely from Government funds existing emigration societies, because we felt that this was the readiest way of affording immediate relief—that it was the safest way as regarded the able-bodied poor, because it did not pauperise them, but aided them in maintaining their independence and self-respect, and that while obtaining for them the means of acquiring an honest livelihood we were relieving our overcrowded population, and affording a few more cubic feet of *less impure air* (it is nonsense to call it pure air) to the dense masses congregated in the most unhealthy localities of our large cities; and last, but not least, that in effecting this we were of opinion that we should not only benefit the emigrants, but materially reduce the poor rates, especially in those districts which are most heavily burthened.

Nature herself, too, seems to point out this mode of relief as that most readily accomplished, and which most effectually meets the necessities of the case. We have but to study the beehive to perceive that so soon as the population becomes oppressive a stir is made by some of the most active members of the community—Government measures are introduced into the House, amid a hum of applause. No dissentient voice is heard (would that similar unanimity in carrying out a good cause to a happy issue prevailed in other assemblies); a thoroughly effectual Emigration Bill quickly passes through the prescribed course of reading, is carried by acclamation, and as speedily acted upon, by the prompt departure of the new swarm, to the inexpressible relief of all concerned.

It would be Utopian to expect that such active measures should be adopted by the lords of the creation, who might often, if they would, learn valuable lessons from the creatures by which they are surrounded; but still, admitting all the difficulties of organisation, of selection, of the application of funds, and so forth, we cannot admit that these objections are insuperable. That the hive is crowded to excess few will deny; that private efforts are quite inadequate to meet the difficulty is generally allowed; that the evil is a growing one is also admitted, and that its consequences are most serious; and yet there is a disinclination, or supposed inability, to do aught to remedy this state of things. It is not that we wish to press emigration as the one only panacea for all the ills that flesh is heir to—let other schemes be adopted by all means. All that we protest against is that no effectual action is taken in any direction, while, owing to a combination of circumstances over which they have had no control, thousands of our fellow countrymen, through no fault of their own, are reduced to a state of deplorable destitution, from which, it would appear, there is no recovery.

FOREIGN MINING AND METALLURGY.

The Belgian coal market has not yet regained its full activity; the future, nevertheless, presents itself under a satisfactory aspect. The current month (March) is a favourable one for coal required for brick-burning and lime-burning purposes, and there appears to be a general expectation, if not of an advance, at least of great firmness. Some rather important contracts for coal for industrial purposes have just been renewed at former rates; Belgian coal-workers are probably entitled to commendation for their good sense in not seeking to advance their rates too suddenly, at the risk of checking and interrupting the demand. Affairs in coal for domestic purposes have shown rather more activity of late, the weather having been somewhat colder; the demand for this description of coal has for the last been generally good during the long winter season from which Europe is now emerging. There are still complaints as to a want of railway plant in certain districts, but these complaints are confined to certain localities; and, taking a general view of matters, it may be said that the supply of material is now becoming sufficient. The railway companies appear to have profited from the representations made to them, and numerous contracts for trucks have been given out. A large part of the orders given out have gone to Belgian firms. Thus the Luxembourg Company has ordered from a Belgian company 300 goods trucks; the trucks will, it is said, be supplied at 25*l.* less than they would have cost if they had been ordered in England. A certain falling off is noticed in the orders which have arrived at the Belgian iron works; there is, however, no cause for uneasiness at present, as the production of the rolling-mills is fully engaged for five or six months in advance. In the course of this period it may be anticipated that orders will arrive in abundance, as considerable railway works are expected to be prosecuted during the ensuing season. No change has occurred in the price of casting and refining pig; the same may be said of iron in bars and plates, for which there exists a satisfactory current of affairs. There are rumours, which cannot, however, be traced to any authoritative source, as to the erection of two new rolling-mills in the Charleroi basin. Some contracts for plant required for the Belgian State lines have been given out during the last few days.

There does not appear at present to be much animation in the iron trade in the Champagne district; there had been some anticipations of a general revival in business, but it has not yet set in. Some orders for iron have arrived at the works, but they are not sufficient to keep them fully employed, and stocks are beginning to accumulate in most cases. Prices still maintain, however, considerable firmness. Charcoal-made pig for refining has made *st.* 12*s.* to *st.* 14*s.* 6*d.* per ton; mixed ditto (half coke-made), *st.* 8*s.* to *st.* 10*s.* 6*d.* per ton; coke-made (Meurthe and Moselle), *st.* 18*s.* 4*d.* to *st.* 19*s.* per ton; casting pig, No. 1 (good marks), *st.* 8*s.* to *st.* 10*s.* at the furnaces. For rolled merchants' iron from charcoal-made pig, first quality, the quotation is *st.* 12*s.* to *st.* 14*s.* per ton; ditto second quality, *st.* 8*s.* to *st.* 10*s.* per ton; merchants' iron from coke-made pig, *st.* 8*s.* to *st.* 10*s.* per ton; refined ditto, charcoal-made and rolled, *st.* 12*s.* to *st.* 14*s.* per ton; ditto, ordinary grain iron, *st.* 11*s.* 4*d.* to *st.* 11*s.* 12*d.* per ton; ditto, fine-grained iron, *st.* 12*s.* to *st.* 14*s.* in warehouse at the works; scale per class, 8*s.* per ton. Machine iron, coke-made, No. 21 and upwards, has made *st.* 8*s.* per ton; ditto, charcoal-made, *st.* 16*s.* per ton; ditto, coke-made, No. 20, first quality, *st.* 10*s.* to *st.* 10*s.* 8*d.* per ton; ditto, second quality, *st.* 12*s.* to *st.* 14*s.* per ton; mixed, No. 20, *st.* 9*s.* 4*d.* to *st.* 9*s.* 12*d.* per ton; coke-made ditto, *st.* 16*s.* per ton; ditto, fine-grained iron, *st.* 12*s.* to *st.* 14*s.* per ton; refined ditto, charcoal-made, first quality, *st.* 12*s.* to *st.* 14*s.* per ton; No. 19, good quality, *st.* 10*s.* to *st.* 10*s.* 8*d.* per ton; No. 18, good quality, *st.* 10*s.* to *st.* 10*s.* 8*d.* per ton. The works of the Moselle group maintain the same state of affairs, furnaces, forges, and foundries being all actively employed. Iron remains at former rates in the Meurthe and the Moselle; rough pig is extremely firm, and various transactions in white pig are stated to have been concluded at *st.* 2*s.* 15*d.* to *st.* 2*s.* 16*d.* per ton; some will not sell at less than *st.* 2*s.* 16*d.* per ton. Two blast-furnaces have just been built at Hayange, and are about to be shortly lighted; their equipments are stated to be of the most excellent and complete description. Hayange now comprises four furnaces lighted, and from 20 to 25 puddling-furnaces. Four furnaces are at work at Stirling-Wendel, where there exist already 40 to 45 puddling-furnaces; two furnaces of large dimensions are being installed at Stirling-Wendel, at Hayange. M.M. de Wendel are about to form at Hayange, Moyeuve, and Stirling a "consumers' society," to be managed by their employees and workpeople; the consumers will benefit from all the profits realised. The Paris iron market has been very quiet, but previous rates are sustained. A contract has just been let at Dunkerque, for the supply of pipes required for the water works of that town, and also for laying them down. M.M. Deplechamps and Mathelin, and M.M. Gossart Freres and Warin, of Lille, secured the contract for contracts, at a reduction of 15 per cent. from the estimates, or altogether at 50*fr.* The pipes will be supplied. It is understood, at *st.* 7*s.* 4*d.* per ton. The Chatillon and Commeny Forges Company has been paying this week its dividend for 1869, or 10*fr.* per share.

The Paris coal market has been quieter during the last few days than it has been for some time past; this is not due to the fact that affairs have experienced any considerable slackening, but because the absence of a rigorous temperature has restricted the demand for

coal for domestic purposes. Notwithstanding all these considerations, prices have preserved a considerable amount of firmness. Much animation has continued to prevail in the coal basins of the Nord, the Loire, and the Pas-de-Calais; and although working operations have been largely extended of late, the stocks on hand are very small. It must be observed, however, that orders have arrived at the mines in somewhat less great abundance than hitherto. There is no intention to propose an advance at present, but it is generally expected that contracts concluded last year for coal for industrial purposes will not be renewed on the same terms.

There has been little change in copper upon the French markets during the last few days. The tone of the Hamburg copper market has been rather better, but transactions have, nevertheless, been somewhat rare. At Rotterdam, Russian has made 51 *fl.*s., and Drontheim 50 *fl.*s. to 52 *fl.*s. There has been no change to notice in tin upon the French markets. In Germany the tendency is now excellent, the article being generally firm. At Rotterdam, Banca has slightly declined to 71 *fl.*s.; Billiton has also fallen to 71 *fl.*s. to 72 *fl.*s.; transactions have been of comparatively little importance, and have been confined to purchases to meet pressing requirements. At Amsterdam the demand for consumption has continued tolerably active. There is little change to notice in lead, either upon the French or German markets; at Hamburg the tendency of prices has been rather less favourable. In zinc there has been no material change.

FOREIGN MINES.

CHONTALES (Nicaragua).—The directors have advices from Mr. Belt, via New York, dated Feb. 8. Gold remitted, 189*oz.*s.; average produce, 6 dwts.; cost of working for the month, 559*fr.* Mr. Belt states that they have accomplished a large amount of work in the development of the mines. No. 5 level, at San Antonio, has been re-opened, and stopping resumed. The deep adit level has also been re-opened. They have doubled the extent of ground available for stopping, that will yield about 6 dwts. per ton, and he adds that the prospects at San Antonio Mine are very encouraging. At Trinidad Mine the deep adit level has been driven 13 varas on the course of the lode, the last 3 varas of which have greatly improved, and of a character that leads to an expectation that valuable discoveries may be made when the stopes are extended upwards. They have commenced to re-open on the San Benito Mine, where there is known to be good ore at shallow depths. Mr. Belt states that the general prospects are good, and he expects in a few months to make larger returns. Mr. Belt considers the supply of timber for all purposes practically inexhaustible. With regard to the telegram (a copy of which was sent out to Mr. Belt), he says—"The pretended telegram from Messrs. Lacayo is a swindle, as you will have gathered from my reports received since. I hope that some clue will be obtained to the rascal who concocted it."

San Antonio Mine, Jan. 31: I beg to hand you my report of the above mine, showing the work done for the month. No. 1 stop, in back of the No. 5 level, cost of working for the month, 559*fr.* The stop was 32 ft. wide, with 7 dwts. of gold per ton. No. 2 stop, in back of the same level, cost of working for the month, 559*fr.* The stop was 32 ft. wide, with 8 dwts. of gold per ton. The No. 5 level east has been driven on the course of the lode 13*varas*; the lode is 4 ft. wide, with 5 dwts. of gold per ton. The new level, west of Piper's shaft, has been driven 25 varas, the last 5 varas having been driven on the course of the lode, which is 4 ft. wide, with $\frac{1}{2}$ oz. of gold per ton. In a few days we can commence stopping in the back of the same, when I have no doubt but that we shall obtain a good supply of quartz. The stopes east of Piper's shaft have yielded during the last eight months from 7 to 8 dwts. of gold per ton, and I see no reason why we may not expect the same from the western ground. We have had three natives repairing the deep adit level for the past month, and I think that this will be completed in about ten days. I have sent a stop in this level to six men, at *st.* 350 per vara; the lode is about 3 ft. wide, and worth from 5 to 6 dwts. of gold per ton. In ten days from this time I hope to be able to send quartz enough to keep 12 heads of stamps working day and night. Quartz is to be sent to the mill, and I estimate at 6 dwts. of gold per ton, equal to 157 *oz.*s. of melted gold.—J. TONKIN.

Trinidad and West San Benito: Report for January. During this month the Trinidad level has been driven east on the course of the lode 13*varas*; the lode is 4 feet wide, yielding a little gold, but not sufficient to value whilst driving the first 10 varas; for the last 3*varas* the lode has greatly improved, being worth at present from 4 to 5 dwts. of gold per ton. In a few days we shall commence to drive a cross-cut north from the Trinidad level, to cut the San Antonio lode, when we hope to meet with good results. We have also commenced to rise in the back of West San Benito level; as yet we have only risen about 2 varas; the lode is 5 ft. wide, yielding a little gold, but not to value.—W. EVANS.

ANGLO-ITALIAN.—Mr. F. Dietzsch reports for February:—"The reduction works have been so far advanced, in spite of drawbacks beyond our control, that on the 21st ult., on occasion of Mr. Morrison's last visit to the mines, the wheel, with the transmission gear, and some smaller machines attached, could be started, and the christening ceremony performed. After an appropriate discourse by Mr. Travers, in presence of the workpeople, Mr. Morrison denominated the wheel Mary Elizabeth. Since that date the other part of the transmission has been run in—all working well, and there remains now only a few lachters further to get into the same run of ore ground; the ground at present is hard, and slow of progress.—Carter's Shaft: The forebreast of the drive at the 70 lachter level is yielding 1 ton of ore per lachter; nothing has been done in the stop below the level during the week, the men being engaged in fixing timber, &c. The rise and stop above the 60, towards Johanne's sink, continue to yield 1 ton of ore per cubic lachter. There is no change to notice in the value of the stopes above the 50, on Dornberger Erzhammer, the yield being 1 ton per cubic lachter. The pitch on Goldschmidt's sink remains at last week. Bore's workings: There is nothing to remark in this part of the mine. Blumengang: The stop above the 70 is worth 2 tons; the stop between the 60 and 70, $\frac{1}{2}$ ton; and the stop above the 60, $\frac{1}{2}$ ton per lachter. The stuff is cleared from the 60, and we shall now commence the drive west, in order to communicate with the West Blumengang workings.—West Blumengang: During the week we have timbered and secured the ground, and cleared the workings, so as to commence driving the 60 lachter level east, to communicate with the other drive as soon as possible. The different pitches throughout the mine remain as for some time past, and yielding their usual quantity of ore."

[For remainder of Foreign Mines see to-day's Journal.]

THE GOLD-BEARING ROCKS OF NOVA SCOTIA.—A preliminary report has just been made by Prof. Hind, upon the rocks supposed by him to represent the great Laurentian system of Sir W. Logan. Prof. Hind considers these rocks to consist of sedimentary deposits, altered by metamorphic action, and that their crystalline structure was produced before the deposition of the gold-bearing rocks which lie unconformably upon them. Gold is found and worked in the Laurentian rocks in Canada, as at the Madoc Mines, and it is not improbable that mines may yet be opened in the Laurentian of Nova Scotia. The area occupied by the Laurentian in Nova Scotia is, probably, not less than one-half that part of the country which has hitherto been represented on geological maps as Lower Silurian. The Laurentian being auriferous inferentially, may yet turn out to be as valuable in mineral wealth as the Silurian deposits now worked. In Canada there are, besides gold, beds of magnetic iron ore, of sulphurets of iron and copper, and of titaniferous iron ore in these rocks, which may also be found in the Laurentian of Nova Scotia, and being in close proximity to the coal fields, may yet prove a great source of wealth.

ELECTRO-DEPOSITED IRON.—Mr. W. C. Roberts, the chemist of the Mint, availing himself of Jacob's process, has achieved something surprising with his specimens of electro-deposited iron. The source of the deposit is a solution of sulphate of iron and sulphate of magnesia; the rate of deposit is about the same as with copper, and the iron thus obtained is so hard that it will scratch glass, and has been found eminently useful for clichés and plates for printing purposes. Among Mr. Roberts's specimens, exhibited at the Royal Society, were bank-note plates, medallions, mouldings, and raised work of various kinds; and one plate had been converted into steel by a process which was not revealed. It is easy to foresee that so successful a method of depositing iron of exceeding hardness may be largely employed in giving a surface to rough iron castings.

A NEW LAMP.—At the Liverpool Polytechnic Society, Mr. A. NORMAN TATE exhibited and explained a new lamp, of French manufacture, from Messrs. Motterhead, of Manchester. The flame is obtained by the ignition of a jet of hydrogen gas evolved by the decomposition of water. The jet of hydrogen is caused by a simple back movement, to impinge upon a piece of spongy platinum, which is first raised to a state of incandescence, and the jet of hydrogen is then inflamed. A small oil lamp is attached, which is ignited by this jet, and a light is thus obtained. The whole apparatus is so arranged as to be capable of affording a light at any time by merely touching a spring tap; all the material required being a small quantity of water, acidified with a little sulphuric acid.

TREATING COAL.—The invention of Mr. T. BARNES, of Whitehaven, consists in applying to the coal, in the presence of heat, chlorine, either in the gaseous form, or as a salt not injurious to the coal or coke, and capable of yielding, by the action of heat, chlorine in a gaseous form.

The Royal School of Mines, Jermyn Street.

MR. WARINGTON SMYTH'S LECTURES.

[FROM NOTES BY OUR OWN REPORTER.]

LECTURE XXXII.—The various methods of wooden and iron tubing for shafts placed before you are very analogous in point of principle, but require in each case a good deal of special knowledge and precaution, to be derived from experience, as to how they can be based and erected. The general efficiency of tubing is best shown in mines where they had several thousands of gallons of water per minute running into the shaft, and where now they are perfectly dry, and where the works have been carried on for years without the assistance of any pumping machinery. This is so important in watery strata that every person who hopes to win any reputation as a mining engineer should make himself master of the circumstances under which tubing is possible, and how it can best be put in. I have a statement here of the quantity of water cut off in a single shaft at different depths and beds. At the first tubing nearest the surface 1500 gallons per hour were stopped out; at the second, 1250 gallons; at the third, 1400 at a still lower point, 5000; and at the last, 6400 gallons. The aggregate of these feeders produced the very considerable quantity of 15,850 gallons per hour, and yet it was entirely shut off, and so much pumping saved. Without this process the very valuable seams of coal obtained by the deep sinking at Shiraz, in North Wales, 500 yards from the surface, might probably have been found utterly inaccessible. In that pit there are several lengths of tubing, and in one place 170 yards, in one continuous length, as much as 500 gallons of water per minute being thoroughly excluded. One very curious accident arose in connection with this tubing. A leak having made itself visible, some men were lowered on a stage to stop it. On commencing operations a sudden outburst of water and air flew out, and the men were blown off the platform and down the shaft. It was afterwards found that there had been an accumulation of air behind the tubing, which, finding a weak place at first, a mere air hole, ended with the outburst, which proved fatal to the lives of the workmen. It is extremely important to get rid of air behind the tubing, because if allowed to remain it becomes so greatly compressed that it finds its way to any weak point, and forces itself out. The same sort of danger exists where the plates may leak from an actual destruction of the material of the cast-iron plates by the effects of sulphuric acid or the settlement of the shaft. Whenever this or, indeed, any other leakage takes place, instant attention should be paid to the matter, and the fault remedied. Many accidents have arisen from want of prompt attention to the first indications of danger. One of the most remarkable cases on record of a frightful accident from such causes is that of St. Marks, in the Department du Nord, where the coal measures occur in a most contorted state, with horizontal upper measures, which descend 273 feet. The shaft was carried to a depth of 230 yards, and then a level was driven out to find the seam. The shaft appeared to hold water very well, and the manager of the mine, on an alarm being given that some of the joints were beginning to let water through, found that the leaks were serious. Indeed, so serious that the whole force of the shaft was insufficient to attend to them. There seemed to be a complete settlement through injudiciously working too near the shaft bottom. They endeavoured to put in iron clamps, and screw the plates together again, but all in vain. At length the tendency to collapse became so evident, and the danger so imminent, that to save life all the men were withdrawn. Very shortly afterwards the whole shaft went down with a tremendous crash, forming a great crater, and swallowing up the engine and all the surface buildings. The company have determined to re-open the colliery, but it is a question whether it will be feasible to do this with any probability of safety to the men—at any rate, the sinking must be entirely new, and at some distance from the old one.

The advantages of tubing have been sought to be attained by building up water-tight masonry and brickwork; and no doubt when the pressure is not considerable it answers very well, but not otherwise. Thus, for instance, at the Matthias Colliery of Saarbrücken, in Prussian Westphalia, a shaft was culled for want of a sufficient curvature, that being on the longer side only 64, and on the shorter 1 in 15. The following calculation as to the strength of brickwork has been made:—If the bricks are 10 in. in length, when the pressure or depth is 15 fms., the sides must not be less than 2 bricks; if 25 fms., the sides must be 3 bricks; if 45 fms., 3 bricks; if 55 fms., $\frac{3}{2}$ bricks; and if 60 fms., 2 bricks; but with all these precautions there have been cases which have turned out unsatisfactory, and very probably the reason is that bricks will not set in water the same as they will in air, and that leads to fractures.

When quicksands have to be penetrated from the surface downwards, other arrangements than getting down by sheer pumping and building up on wedging curbs have to be made. If the beds are soft and watery tubing may be forced down (as in lining bore-holes) by laying planks across, and putting weights on them, and then fastened together with flanges and screw bolts. When this is found to be ineffective, the application of some degree of impact may be had recourse to, but this is rather dangerous. When no further progress can be made the water must be pumped out from the interior, and the loose soil from within taken out. A great difficulty in these watery measures arises from the circumstance that when the bottom of the detrital material is reached, hard and is in stones generally prevail. (The lecturer exhibited the model of a shaft in Siluria, sunk in this manner, when upon wooden curbs and planks strong masonry was built, and carried down by its own weight.) At the same time, the same plan was adopted, the masonry was strongly banded together with iron, and then the interior excavated. Of course, great care is requisite that the downward motion shall be equable. Blackfriars Bridge might be quoted as an example of this kind of work, the brick and stonework of the piers being built within iron caissons, sunk to a sufficient depth by their own weight.

One of the most interesting cases in which natural difficulties, apparently insurmountable, were overcome is that of shafts sunk in the valley of the Loire. The valley is underlaid with coal measures, which are covered with sand, gravel, &c. Shafts, lined with boiler plates, were driven down by pressure of air, but it was found that just at the bottom of the previous strata, where, in fact, the pressure was greatest, a bed of boulders came in and caused the tubing aside, or prevented its progress. Pumping was impossible; it would have been as easy to pump dry the River Loire. The shaft was considered lost, but Mr. Triger, an eminent geologist and colliery engineer, was called in, and the idea struck him that the water might be kept out by the introduction of compressed air to counteract it. The pressure was at first only 50 pounds in the square inch, and the question was raised as to the pressure of the atmosphere of the same density, so as to allow the men to get to the bottom, and remove the obstacles to the downward progress of the tubing. This was achieved by constructing an air-tight chamber in three compartments, into which compressed air was pumped in from the surface until the water was forced out. The men at the bottom, thus enabled to work, filled the kibble with boulders, which were then drawn up into the middle chamber through a valve door; the communication was then closed, and a similar door opened in the floor above, and so reached the surface without altering the condition of the air in the chambers. These chambers acted in reference to the air like the locks of a canal, forming, in fact, an air lock. At first it was considered by scientific authorities at Paris impossible that the men could work in such an atmosphere, but Mr. Triger told it first himself at a pressure of $\frac{1}{2}$ atmospheres, then at 3, and then of $\frac{3}{2}$ atm., and took a regular turn at the work. It was found that the men could stand it very well, the only precaution necessary being that of making the transfer from the one to the other atmosphere gradual. Mr. Triger, indeed, submitted himself to a working pressure of four atmospheres, and except an uncomfortable sensation in the ears he found that he could stand it very well. If only he had through the intermediate stage with sufficient slowness. Steady men of moderate habits, therefore, were easily got to perform the work. In carrying out this contrivance Mr. Triger found himself at one time at the very extent of his power, without being able to reap the full advantage, when a very curious accident occurred, which at once suggested remedey. The water, which is driven back by the compressed air, is got rid of by a pipe, which is carried up the shaft to the surface, ending in a snore-pipe. After the work had gone on for some time, and the depth of the sinking increased, the snore-pipe was cut off, and the great in the pipe that the pressure of the feeder could not drive it up, when one of the men at work in the lower chamber accidentally knocked a hole in the pipe; the compressed air rushed through the hole, and immediately a jet of water was thrown out at the top like the contents of a bottle of soda water. The intermixture of the air which passed through the hole rendered the column of water of so much less weight than the solid water, and hence this remarkable result. In another instance, too much pressure being applied by the air-pump at the surface, the water was forced down to the bottom of the escape pipe, and from the same cause a jet of water shot up to the height of 60 ft. Mr. Triger, of course, turned this phenomenon to account by a proper admission of compressed air into the pipe, and the water was got rid of with regularity and success. This plan has been found to answer not only in Belgium and Westphalia, but in our colliery districts. Accidents, however, have occurred from having too much air pressure, when the iron chambers have been lifted bodily up.

Another method may be mentioned which has been attended with admirable results within the last few years. The long range of New Red Sandstone in the French district of the Moselle is known to be extremely watery, and several attempts had been made to reach the bed of coal beneath by operations both on the French and on the Prussian side. Hundreds of thousands of pounds had been spent in trying to get down through the watery measures, and without success. Mr. Kind then succeeded by a boring apparatus (which I have described in a previous lecture), in which several borers, weighing 13 tons each, were suspended from rods. Then came the question how was the shaft to be kept open, and how was it to be lined? This was done by means of what may be called a "travelling lining," which was let down as the boring advanced, and the special arrangement had to be made for lowering, and it was effected by the aid of powerful screws. At the mine called L'Hopital the weight to be lowered eventually reached 600 tons. At the bottom it came into a properly prepared moss box, in which the moss formed a sort of cushion, but so pressed down by the weight as to form so solid and condensed a mass as to make a perfectly water-tight joint. In this niveau plain the pressure of the water on the sides was equal, and the bottle mousée took the place of a wedging curve. The cost of sinking 25,000 ft. through this most difficult ground to a depth of 150 yards was only 25,000*fr.*, there being no doubt but that it would have cost twice or three times that sum if put down by the ordinary methods. We cannot help thinking after successes of this kind that the future of mining in this country will see the introduction of many processes of this nature, and depths will be attained, and difficulties overcome, which would have been insurmountable to our grandfathers. Every step taken, therefore, in this direction is of the greatest importance to those employed in working the stratified deposits, and who have to deal with the special difficulties which so often occur in deposits to which this kind of tubing is applicable.

LONDON: Printed by RICHARD MIDDLETON, and published by HENRY BARNES (the proprietors), at their offices, 26, FLEET STREET, E.C., where all communications are requested to be addressed.—March 19, 1870.